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REMARKS

This amendment is filed in response to the Examiner's office action dated May 30, 2003. In this nonfinal office action, the Examiner has:

1. Rejected claims 1-11, 20-27 and 29-53 under 35 U.S.C. Section 103(a) as being unpatentable over Floden., U.S. Pat. No. 4,148,439, in view of Karlstrom, U.S. Pat. No. 6,024,309;
2. Indicated as allowable claims 12-19; and
3. Allowed claim 28.

In response, applicant has amended claims 1-9, 12-17, 24-27, 29-31, 33-36, 38, 44, 46, and 49-53, canceled claims 20, 37, 39-41, 43, and 45, and presents new claims 54-63.

Response to Rejections under 35 U.S.C. 103(a)

Independent Claim 1

Independent claim 1 has been amended to include some limitations previously recited claim 15, a claim indicated as allowable by the Examiner. More specifically, claim 1 has been amended to recite that the sensor disposed in the refiner senses a parameter of the refining zone that is used, along with an initial consistency value, to determine consistency of stock flowing through the refiner in real time during refiner operation.

This recited combination of structural limitations provides a novel method of determining consistency of stock in the refiner in real time during refiner operation. The term "real time," as it is used in this particular claim, means that consistency is determined at about the same rate at which sensed parameter data is received by the processor. The claimed method facilitates faster and more accurate consistency determination of stock flowing through the refiner, where such consistency information can be used, for example, in helping to better facilitate automatic control of the refiner. This novel combination of method steps recited in claim 1 is not rendered obvious by the purported combination of Floden and Karlstrom for *at least* the following reasons:

First, neither Floden nor Karlstrom disclose, teach or suggest a method or apparatus for determining consistency of stock, much less determining consistency in real time during refiner operation as a function of refining zone position. In fact, neither reference even mentions consistency. The term "consistency," as it is used in the pulp and paper industry (and in applicant's background), is a measure of the solids content in a pulp slurry. *See, e.g.,* definition of "Consistency," presented on page 18 of *Handbook of Pulping and Papermaking, 2d Ed. 1996*, attached hereto at Exhibit A.

Consistency is neither quality nor dewatering ability, fiber length, fiber width, proportion of shives, tear resistance, light dissipation, tensile strength, or another such property. While consistency based control may have an impact on one or more these other parameters, each of these properties is not consistency.

Second, neither Floden nor Karlstrom contain any disclosure of how to determine consistency, much less a disclosure sufficiently enabling for one of ordinary skill to be able to determine consistency using measurements taken in the refining zone. Since neither one of these references contains an enabling disclosure that would enable one skilled in the art to practice the claimed method recited in claim 1, the rejection of claim 1 must be withdrawn.

Third, neither Floden nor Karlstrom, alone or in combination with each other, disclose, teach or suggest determining consistency using a sensed parameter of the refining zone, such as stock temperature, stock pressure, etc., along with an initial consistency value. Such an initial consistency value is neither disclosed, taught or otherwise suggested in either Floden or Karlstrom.

Fourth, the office action fails to set forth a prima facie case of obviousness. A prima facie case of obviousness requires three basic criteria. *First*, there must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. *Second*, there must be a reasonable expectation of success in doing so. *Third*, prior art references, when combined, must teach or suggest all of the claim limitations. ***Here, applicant submits, at least***

the first and third prongs of a necessary prima facie obviousness burden of proof have not been met.

With respect to the first obviousness prong, both errors of law and errors of fact are present. As to the errors of law, the official action has failed to specifically identify any suggestion or motivation to combine the reference teachings, either in the references, or in the knowledge generally known to one having ordinary skill the art of material handling vehicles.

Turning first to the errors of law, while the rejection of claim 1 is based on 35 U.S.C. § 103, it fails to properly identify a legally cognizable suggestion for combining the cited art to re-create the combination recited in claim 1. The bedrock legal principles for rejecting a claim under 35 U.S.C. § 103 are well known and understood. Specifically, in *In re Rouffet*, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998), the Federal Circuit explained:

> To reject claims in an application under section 103, an examiner must show an unrebutted prima facie case of obviousness. In the absence of a proper prima facie case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent.

Id. at 1455 (citations omitted and emphasis added). In the *Rouffet* case, the Examiner had rejected the pending claims on a combination of references. The Board sustained the Examiner. However, the Federal Circuit reversed the Board's decision and ruled that the Examiner's rejections were legally impermissible for failure to demonstrate a suggestion or motivation to combine the references in the manner proposed by the Examiner.

As explained by the Federal Circuit:

> As this court has stated, "virtually all [inventions] are combinations of old elements." Therefore, an examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be "an illogical and

> inappropriate process by which to determine patentability." To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.

Id. at 1457 (citations omitted and emphasis added). These principles have not been followed in rejecting the pending claims in this application.

On the contrary, the rejections based on multiple references contained in the Office action amount to nothing more than a recitation of the elements allegedly found in the cited references followed by a conclusory statement that, given the alleged presence of these elements in the cited prior art, a person of ordinary skill in the art would have found it obvious to combine the references to create the claimed invention. The action then essentially sets forth some vague conclusory statement why one of ordinary skill in the art would agree. *The problem with this approach is that it effectively eliminates the necessary requirement of identifying a suggestion for combining references from the obviousness analysis.* More specifically, the analysis present in the Office actions proceeds in the following manner:

a) What elements are present in the pending claims?
b) Can these elements be found in prior art references?
c) If they can be found, and the references themselves provide no suggestion for combining these elements, can some end or advantage be identified to combine the elements in the manner proposed in the applicant's claims?
d) If so, combine the elements in the manner proposed by the applicant and reject the pending claims.

This process is, of course, deeply flawed. Specifically, as noted by the Federal Circuit in the quote identified above, all of the elements of most claimed inventions can almost always be found in the prior art. Therefore, the answer to step "b" above will almost always be "yes". Since it is a statutory requirement that all inventions have utility, there will also always be an identifiable end or advantage in combining the elements in the prior art in the manner proposed

by any claim. Often, as here, the advantages to combining reference teachings are easily found *using improper hindsight* in looking to the claimed invention. Therefore, if the "suggestion" requirement of 35 U.S.C. § 103 can be met by merely identifying any end or advantage which will be achieved by combining the elements of the prior art references, the suggestion requirement can always be met and is utterly meaningless.

This inherent flaw in the analysis employed in the Office action is brought to light by an example of this type of alleged "motivation" to combine the reference teachings relied upon in the Office action. Taking claim 1 as an example, the office action improperly tries to equate stock consistency as merely being "the goal of obtaining by regulation or control, similar, or nearly the same, desired characteristics of the refined fiber or fibrous stock." This is improper because stock consistency is a very specific property of stock, and is not the same as dewatering ability, fiber length, fiber width, proportion of shives, tear resistance, light dissipation, tensile strength, applied refiner disk pressure, rate of flow of fibrous material into the beating/refining zone, rate of flow of nozzle water into the refining zone, or the steam pressure in the refining zone.

Thus, the action concludes it "would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate Floden's internal temperature and pressure sensors disposed on the refiner disks themselves into the refining process control system of Karlstrom because real-time temperature and/or pressure measurements can be used directly in order to relate them to the various quality factors (indicated above) of refined fiber, and ultimately, to minimize quality variations or *consistency* of finished fiber products[1]." This naked, conclusory statement amounts to nothing more than concluding that a person of ordinary skill in the art would be motivated to add any missing claim limitation element to Floden because they would want to gain a benefit of adding whichever elements is or are missing. In other

---

[1] Consistency, as recited in claim 1, *is not the consistency of the finished fiber product*, but rather is a measurement that relates to how much pulp fiber is entrained in the liquid stock. Consistency is usually expressed in terms of a percentage, e.g., 3% consistency, 17% consistency, etc.

words, the only motivation proffered in the Office action is to achieve the desired benefit of adding each missing element. Of course, such circular reasoning cannot be a legally proper tool for identifying a suggestion for combining references. If it were, no combination of old elements would ever be patentable since one can always nakedly state such a motivation.

In summary, applicant respectfully submits that each of the §103 rejections must be withdrawn because they each independently fail to identify a legally proper suggestion or motivation for combining the prior art references in the manner proposed by the Office.

Errors of fact are also present in the obviousness rejections. First, there is no legally proper motivation or suggestion to combine the purported reference teachings. To illustrate, while both Floden and Karlstrom are concerned with refiner control, neither one are concerned with doing so on the basis of consistency. Second, when Karlstrom is carefully examined, it teaches away from being combined with Floden as it cites the parent of Floden (Swedish Patent No. 407,952, copy attached at Exhibit B) in its background noting:

> Swedish Patent No. 407,952 discloses a method and apparatus for controlling the beating in a refiner including temperature and pressure gauges supplying signals to a computer which conducts the beating process. *The signal values are, however, not used for the purpose of controlling the quality of different parameters of the mass, or of paper produced from the mass.*

See Karlstrom, col. 2, lines 22-28. (Emphasis added). Thus, Karlstrom teaches away from using the temperature and pressure signal values of Floden in conducting the beating process. As a result, one of ordinary skill in the art would not have looked to Karlstrom with the disclosure of Floden in front of him or her. *Such a teaching away further reinforces applicants' contention that the combination of Floden and Karlstrom is improper.*

Further, there simply is no reference within Floden that pertains to consistency, much less the desirability or capability of determining consistency. For this further reason, Floden therefore also fails to provide the necessary motivation or suggestion to combine the teachings of Karlstom with those of Floden with regard to the determination of the measurement stock consistency whether or not consistency is used for refiner control.

The office action has simply failed to point to any evidence of a suggestion or motivation, either in the cited art or in the knowledge of those of ordinary skill, to combine Floden and Karlstrom. Substantial evidence of such suggestion or motivation to combine reference teachings is necessary for a prima facie case of obviousness. *In re Zurko*, 96-1258, August 2, 2001 (Fed. Cir. 2001). The Federal Circuit has repeatedly held that the tactic of using improper hindsight as motivation to combine references does not meet the necessary burden of proof for raising an obviousness rejection. Therefore, the first necessary prong of establishing a prima facie case of obviousness fails. Independent claim 1 is in condition for allowance based on at least these grounds.

The third prong of a prima facie obviousness showing is also not met. The combined teachings of these two references, *even if improperly combined*, also fail to disclose, teach, or suggest all of the limitations of independent claim 1. Claim 1 recites "determining consistency of stock ..." which is not disclosed, taught or suggested in either Floden or Karlstrom. Claim 1 further recites that the consistency of stock determined is done so using a sensed parameter of the refining zone and an initial consistency value. Neither of these limitations are disclosed, taught or suggested by Floden or Karlstrom.

For at least these reasons, applicant asserts claim 1 is presented in condition for allowance, and allowance is respectfully requested.

Dependent Claims 2-19 and 21-23

With regard to claim 2, neither Floden nor Karlstrom disclose, teach or suggest determining consistency using temperature sensors and a temperature in the refining zone obtained using the temperature sensors.

With regard to claim 3, neither Floden nor Karlstrom disclose, teach or suggest determining stock consistency using a processor that comprises a Distributed Control System (DCS). These claim limitations are not trivial. Rather, these claim limitations reflect the flexibility inherent in applicant's method of determining consistency as it is capable of using a processor of a DCS that is appropriately configured. This takes advantage of often existing

hardware in a pulp processing plant that can be a paper mill, a fiber product manufacturing plant, a pulp making plant, or the like.

With regard to claim 4, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency that uses a processor that is linked to a DCS. The claimed arrangement contemplates the possibility of having to retrofit a pulp processing plant with a processor that that can be solely configured to carry out the claimed method of determining stock consistency as a function of position in the refining zone with the processor being linked to the DCS.

With regard to claim 5, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where each one of the plurality of temperature sensors is disposed in one of the refiner disks or refiner plates and the sensors are used in obtaining a temperature of stock in refining zone.

With regard to claim 6, neither Floden nor Karlstrom disclose, teach or suggest determining consistency using pressure sensors and a pressure in the refining zone obtained using the pressure sensors. Such an arrangement is advantageous, for example, as it is capable of providing a pressure in the refining zone even when stock in the refining zone has been vaporized into steam.

With regard to claim 7, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where each one of the plurality of pressure sensors is disposed in one of the refiner disks or refiner plates and is used in obtaining a pressure of stock in refining zone that is, in turn, used in determining stock consistency.

With regard to claim 8, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency that uses both a temperature and a pressure of the refining zone. Such a pressure and temperature can be, for example, a pressure of stock in refining zone and a temperature of stock in refining zone.

With regard to claim 9, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where there is a signal conditioner between the sensor and the processor and a DCS that is linked to the processor downstream of the signal conditioner.

With regard to claim 10, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where the sensed parameter is communicated to the processor using the link between the sensor and the processor.

With regard to claim 11, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency using a signal conditioner between the sensor and the processor that receives a signal from the sensor and outputs a conditioned signal to the processor that is used in obtaining the sensed parameter during step (b).

With regard to claim 12, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where the refiner is equipped with the motor that drives the refiner thereby providing power to the refiner with the sensed parameter being a temperature or pressure in the refining zone of the refiner and stock consistency being determined using the temperature or pressure in the refining zone, a distribution or more load in refining zone, and the initial consistency value that is recited in claim 1.

With regard to claim 13, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where the sensed parameter is a temperature or pressure in the refining zone that is used along with refiner specific power in determining stock consistency.

With regard to claim 14, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where the sensed parameter is a temperature or a pressure in the refining zone that is used along with specific steam generation rate, dry wood throughput, latent heat of steam, specific power, wood heat capacity, and water heat capacity in determining stock consistency.

With regard to claim 15, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where the sensed parameter is a temperature or a pressure in refining zone that is used along with specific power to determine stock consistency as a function of radial position in the refining zone.

With regard to claim 16, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency where the sensed parameter is a stock temperature or a

stock pressure in refining zone that is used along with specific steam generation rate, dry wood throughput, latent heat of steam, specific power, wood heat capacity, and water heat capacity.

With regard to claim 21, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency that further employs a controller that uses the determined stock consistency to control some aspect of refiner operation.

With regard to claim 22, neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency that further employs a controller that adjusts the mass flow rate of fiber being introduced into the refiner using the determined stock consistency that was determined in real time during refiner operation.

With regard to claim 23 , neither Floden nor Karlstrom disclose, teach or suggest a method of determining stock consistency that further employs a controller that adjusts the rate of dilution water flow being introduced into or upstream of the refiner using the determined stock consistency.

Independent Claim 24

Independent claim 24 has been amended to such that stock consistency is determined using a sensed parameter inside the refining zone, a distribution of motor load in the refining zone or specific power, and *initial consistency*. The limitations of motor load distribution in or along the refining zone and specific power were recited in dependent claims 12 and 13, indicated as reciting allowable subject matter in the office action. In addition, these limitations, alone or *in combination*, are not disclosed, taught or otherwise suggested by Floden or Karlstrom. As such, it is believed independent claim 24 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 25

Independent claim 25 has been amended to recite all of limitations found in originally presented dependent claim 16 except specific power, a claim indicated in the office action as reciting allowable subject matter. As previously discussed with regard to claim 1, Karlstrom and Floden are improperly combined. Moreover, none of the cited references of record, including Karlstrom and Floden, alone or in combination, disclose, teach or suggest the recited method of determining consistency that includes using specific steam generation rate, dry wood throughput, latent heat of steam, wood heat capacity and water heat capacity. For at least these reasons, applicant asserts that independent claim 25 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 26

Independent claim 26 has been amended to recite some limitations found in originally presented dependent claims 12 and 13, claims that were indicated in the office action as reciting allowable subject matter. More specifically, claim 26 has been amended to recite a method where consistency is determined as a function of position or location inside the refining zone using (1) a parameter in the refining zone obtained from a sensor disposed in one of the refiner plates, and (2) either refiner motor load distribution in the refining zone or refiner specific power. *None* of these limitations are disclosed, taught or suggested by Floden or Karlstrom. For at least these reasons, applicant asserts claim 26 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 27

Independent claim 27 has been amended to recite that consistency is determined during refiner operation using an obtained temperature or pressure in the refiner, a latent heat of steam, a wood heat capacity, a water heat capacity and a refiner load/power. As previously discussed with regard to claim 1, Karlstrom and Floden are improperly combined. Moreover, none of the cited references of record, including Karlstrom and Floden, alone or in combination, disclose, teach or suggest the method of determining consistency recited in claim 27. For at least these reasons, applicant asserts claim 27 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 28

Independent claim 28 has been indicated in the office action as reciting allowable subject matter. It has not been amended in this office action response.

Independent Claim 29

Independent claim 29 has been amended to recite most of the limitations found in originally presented dependent claim 16, a claim indicated in the office action as reciting allowable subject matter. As previously discussed with regard to claim 1, Karlstrom and Floden are improperly combined. Moreover, none of the cited references of record, including Karlstrom and Floden, alone or in combination, disclose, teach or suggest the method of determining consistency recited in claim 29. For at least these reasons, applicant asserts claim 29 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 30

Independent claim 30 recites determining a consistency of stock in the refining zone using an obtained refining zone temperature or refining zone pressure and a distribution of motor load in the refining zone. As previously mentioned with regard to independent claim 1, Floden and Karlstrom are improperly combined. Moreover, neither Floden nor Karlstorm are concerned in any way with stock consistency determination as neither reference even mentions consistency. Finally, neither Floden nor Karlstrom describe any method remotely close to that which is recited in claim 30, much less in a manner that would enable one of ordinary skill in the art to make and use the claimed invention. For at least these reasons, applicant asserts claim 30 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 31

Independent claim 31 has been amended to recite that the processor determines consistency of stock being refined during refiner operation using a condition signal that detects a process condition related to a physical property of the stock and at least a plurality of the following parameters: refiner main motor power, force exerted on the refiner disks urging them together, dilution motor power, refiner case pressure, refiner inlet pressure, chip washing water temperature, dilution water temperature, and refiner disk gap. As previously mentioned with regard to independent claim 1, Floden and Karlstrom are improperly combined. Moreover, neither Floden nor Karlstorm are concerned in any way with stock consistency determination as neither reference even mentions consistency. Finally, neither Floden nor Karlstrom describe any system remotely close to that which is recited in claim 31, much less in a manner that would enable one of ordinary skill in the art to make and use the claimed invention. For at least these reasons, applicant asserts claim 31 is presented in condition for allowance, and its allowance is respectfully requested.

Dependent Claims 32-36, 38, 42, 44, and 46-50

With regard to claim 32, neither Floden nor Karlstrom disclose, teach or suggest a system that further includes a controller that compares the determined consistency to a setpoint and provides an output in response to the comparison that is used in controlling some aspect of refiner operation. With regard to claim 33, neither Floden nor Karlstrom disclose, teach or suggest a system where the controller is configured to provide an output that causes determined stock consistency to converge toward the consistency setpoint.

With regard to claim 34, neither Floden nor Karlstrom disclose, teach or suggest a system for determining stock consistency that uses an array of sensors disposed in the refiner with each sensor being used to detect a process condition related to stock consistency or which is used in determining stock consistency. With regard to claim 35, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system where the process condition detected by each one of the sensors of the sensor array is a temperature of stock with the processor averaging these stock temperatures and using the average temperature in determining stock consistency. With regard to claim 36, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system wherein the process condition detected by the array of sensors includes a temperature of stock entering the refiner as well as a temperature of stock in the refining zone, with the temperatures being averaged to obtain an average temperature that is used in determining stock consistency.

With regard to claim 38, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system that further includes a controller that is used to regulate some aspect of refiner operation where the regulation takes place in real time during refiner operation using the determined consistency.

With regard to claim 42, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system that includes a sensor carried by the refiner that is located upstream of the refining zone which is used to detect a process condition related to a physical property of the stock from which a signal can be obtained, which is conditioned, and used in the determination of stock consistency.

With regard to claim 44, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system where the condition signal from the sensor is used to detect or obtain a temperature of stock in the refining zone.

With regard to claim 46, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system that uses a control output to control operation of a dilution water pump to regulate the flow rate of dilution water entering the refiner in response to determined stock consistency.

With regard to claim 47, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system where the processor provides a control output that alters a volumetric flow rate of stock entering the refiner in response to the determined stock consistency.

With regard to claim 48, neither Floden nor Karlstrom disclose, teach or suggest a consistency determination system where the processor provides a control output that can alter the rate of rotation of a feed screw used to control the mass flow rate of fiber entering refiner in response to determined stock consistency.

With regard to claim 49, neither Floden nor Karlstrom makes any mention whatsoever of a Distributed Control System (DCS), much less a DCS that is used to determine stock consistency.

With regard to claim 50, neither Floden nor Karlstrom discloses, teaches or suggests a stock consistency determination system that further includes a DCS that is in communication with the processor that is used in determining stock consistency.

Independent Claim 51

Independent claim 51 has been amended to recite a system of determining a consistency of stock in a refiner where the processor determines stock consistency using a temperature or pressure determined in the refining zone, refiner main motor power, refiner disk force, refiner case pressure, and refiner inlet pressure. Neither Floden nor Karlstrom discloses, teaches or suggests a system of determining consistency, much less a system of determining consistency using, among other things, refiner main motor power, refiner disk force, refiner case pressure,

and refiner inlet pressure. For at least these reasons, applicant asserts claim 51 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 52

Independent claim 52 has been amended to recite a system for determining stock consistency of a plurality of refiners with each refiner having a plurality of refiner plates that define a refining zone in which stock is refined wherein each refiner has a plurality of sensors disposed in one of its refiner plates from which at least one temperature or pressure in the refining zone is determined and the system including a processor that determines stock consistency in each refiner in real time using the at least one determined temperature or pressure for the corresponding refiner. Neither Floden nor Karlstrom discloses, teaches or suggests a system for determining consistency of a single refiner, much less a system of determining consistency for a plurality of refiners. For at least this reason, applicant asserts claim 52 is presented in condition for allowance, and its allowance is respectfully requested.

Independent Claim 53

Independent claim 53 has been amended to recite a system for determining stock consistency of a plurality of refiners with each refiner having a plurality of refiner plates that define a refining zone in which stock is refined wherein each refiner has an array of sensors disposed in one of its refiner plates that output signals relating to a characteristic of stock in that refiner, the signal conditioner that receives the signals from each array of sensors and, in turn, output's conditioned signals, a processor that uses the conditioned signals to determine stock consistency for the corresponding refiner, and a DCS that communicates the added to the processor for each refiner that is used in determining stock consistency for the corresponding refiner. Neither Floden nor Karlstrom discloses, teaches or suggests a system for determining consistency of a single refiner, much less a system of determining consistency for a plurality of refiners. Moreover, neither Floden nor Karlstrom discloses, teaches or suggests a system for determining anything using data from a Distributed Control System. For at least these reasons,

reasons, applicant asserts claim 53 is presented in condition for allowance, and its allowance is respectfully requested.

Newly Presented Claims

Claims 54-75

Claims 54-75 are believed to be presented in condition for allowance and their consideration and allowance is respectfully requested.

Conclusion and Request for a One-Month Extension of Time

All of the claims as amended are believed to define patentable subject matter and to be in proper form for allowance. Therefore, consideration and allowance of the presently pending claims are respectfully requested.

Applicant has enclosed a check in the amount of $800, of which $690 is allocated for the addition of 15 additional claims over the number previously presented and 5 additional independent claims over the number of independent claims previously presented, and $110 for a one-month extension of time from August 30, 2003 to September 30, 2003 to respond to the May 30, 2003 office action for a large entity.

The Commissioner is also authorized to charge payment of any other fees associated with this communication or credit any overpayment to Deposit Account No. 50-1170.

Respectfully submitted,

David D. Stein
Reg. No. 40,828

Dated: Sept. 30th, 2003

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EXHIBIT A

Handbook of PULPING AND PAPERMAKING

SECOND EDITION

Christopher J. Biermann

DEPARTMENT OF FOREST PRODUCTS AND
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Cover photo: Working model of Louis Robert's papermaking machine at the Science Museum, South Kensington. Reproduced with permission of the the Trustees of the Science Museum (Neg. No. 1013/52).

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EXHIBIT A

Reaction wood

Trees under physical stresses such as the weight of heavy branches or leaning trunks produce wood that *reacts* to these stresses and is known as *reaction wood*. In practice, there is little one can do about the presence (or absence) of reaction wood, but it is usually not present in large amounts.

Angiosperms (hardwoods) produce *tension wood*, which is usually located on the upper side of branches or leaning trunks where the wood is under a tension force. Tension wood has fewer vessels, and those are of smaller diameter, a thick *gelatinous layer* in the cell wall on the lumen side, and a higher cellulose content than normal wood. Tension wood produces pulp with higher yield, but with lower strength, than normal wood, which makes it well suited for dissolving pulps.

Gymnosperms (softwoods) form *compression wood* on the lower side of branches or leaning trunks, where the wood is under a compression force. Compression wood tends to have a higher proportion of latewood, higher lignin content, higher density, and higher hardness compared to normal wood, making it less suited for pulping. TAPPI Standard T 267 has photographs and methods for compression wood identification.

Moisture content (wet or green basis), MC_{GR}

The moisture content based on the wet weight of material is used in pulp and paper mills for wood as well as most other raw materials such as pulp, paper, and fillers. It represents the amount of water in wood as a fraction of the *wet* weight of wood. If no subscript is used one can generally assume the moisture content is on a wet basis in the pulp and paper literature. The weight of water is determined by weighing the wood before and after drying at 105°C. The green-basis moisture content of freshly cut wood is typically 50%, but can vary from about 30-60%.

$$MC_{GR} = \frac{\text{mass } H_2O \text{ in wood}}{\text{wet wood mass}} \times 100\,\%$$

Moisture content (dry basis), MC_{OD}

A measure of the moisture content of wood based on the oven-dry (an obsolete term is bone dry) weight of wood is used by wood scientists and foresters. It represents the amount of water in a wood sample divided by the *oven-dry* weight of wood material. The oven-dry weight is obtained by drying the wood to constant weight at 103-105°C (217-221°F). Freshly cut wood has an oven-dry basis moisture content on the order of 100%, although it varies from about 45-150%.

$$MC_{OD} = \frac{\text{mass } H_2O \text{ in wood}}{\text{oven-dry wood mass}} \times 100\,\%$$

Solids content

The solids content is a measure of the solid material in wet samples such as wood, pulp, and paper. The term *consistency* is used instead of solids content in pulp slurries.

$$\text{solids content} = 100\,\% - MC_{GR}$$

$$\text{solids content} = \frac{\text{oven-dry sample mass}}{\text{wet sample mass}} \times 100\,\%$$

Solid wood density

Solid wood density is a measure of the dry weight of wood per unit volume of green wood. Since wood contracts about 8-15% on a volume basis as it is dried below 30% moisture, it is important to specify the moisture content at which the volume was measured. Typical units are lb/ft^3, g/cm^3, or kg/m^3.

Specific gravity

Specific gravity is the (unitless) ratio of the *solid wood density* to the density of water at the same temperature. The solid wood density may be determined using the green volume, the oven-dry volume, or intermediate volumes. This is notable as wood shrinks about 8-15% as it dries. The *basic specific gravity* always uses the green volume. [The density of water at 20°C (68°F) is 62.4 lb per cubic foot, 1 gram per cc, or 1 metric ton per cubic meter.] Softwoods have typical specific gravities of 0.35-0.50 g/cc on a green volume basis, but can vary from 0.29-0.60 among North American commercial species; hardwoods have typical specific gravities of 0.35-0.60 on a green volume basis, but can vary from 0.30-0.90 among the North American, commercial species. Balsa wood, used in model-building, has a basic

EXHIBIT B

Method and device for controlling the energy consumption in a pulp refining system

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Abstract

Method and apparatus for coordinating the rate of feed and the moisture content of the pulp material to the heat quotients of the mechanical energy input in a refiner system in which the moisture-containing pulp material is introduced at an adjustable rate of feed into the central portion of an axially adjustable grinding space defined between a pair of grinding discs which rotate relative to one another within a closed housing and in which grinding space the material is propelled by centrifugal force created by the rotation of the discs in an annular radial path toward the periphery of the discs while being subjected to a grinding operation in an environment of steam generated by the heat produced by friction in the grinding space. The heat quotients of the mechanical energy are sensed as the pulp material progresses along its radial annular path in the grinding space and the rate of feed and moisture content of the material and the width of the grinding space are coordinated to the sensed heat quotients to produce pulp of optimum values with minimized consumption of mechanical energy.

EXHIBIT B

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(54) Benämning: Sätt och anordning för malning av fiberhaltiga material

Föreliggande uppfinning avser ett sätt vid malning av fiberhaltiga material med tillhjälp av relativt varandra roterande malorgan mellan vilka malgods passerar från malorganens innerperiferi till deras ytterperiferi genom en mellan malorganen bildad malspalt, och vid vilket avkännarorgan användes för att avkänna malgodsets tillstånd i malspalten.

För att vid malning av fiberhaltiga material erhålla en god kvalitet på malgodset måste de störningar i driftsbetingelserna som av olika skäl uppträder hela tiden korrigeras genom ständig reglering av de olika malparametrarna till optimala värden, exempelvis medelst ändring av vattentillförseln, så att en större eller mindre kyleffekt uppnås, ändring av malgodsflödet eller justering av avståndet mellan malorganen eller en kombination av dessa åtgärder. För att kunna genomföra de nödvändiga justeringarna och korrigeringarna krävs en noggrann bestämning av den totalt till malgodset överförda energien liksom även av fördelningen av den överförda energien över malorganens yta. Detta har hittills inte varit möjligt att genomföra på ett tillfredsställande sätt.

Enligt föreliggande uppfinning åstadkommes ett sätt att snabbt och noggrant bestämma och reglera både den till malgodset av malorganen totalt överförda energien och dess fördelning över malorga-

nens ytor, vilket sker därigenom att tillståndet hos malgodset kontinuerligt mätes vid ett flertal punkter i radiell riktning utefter malgodsets passage från malorganens inner- till deras ytterperiferi och att malprocessen styres i beroende av mätresultatet.

Övriga kännetecken för sättet enligt uppfinningen och för en enligt uppfinningen utförd anordning för att genomföra sättet kommer att framgå av patentkraven och av den följande beskrivningen av ett föredraget utföringsexempel på en anordning för sättets genomförande, vilken beskrivning hänför sig till de bifogade ritningarna.

Figur 1 visar i perspektiv de för uppfinningens förtydligande väsentliga delarna av en malapparat.

Figur 2 visar ett segment av det ena malorganet i malapparaten enligt figur 1.

Figur 3 visar en vy liknande figur 2 av en annan utföringsform.

Figur 4 visar i större skala ett snitt genom malorganet i figur 2.

På ritningen visas uppfinningen i samband med en malapparat i form av en raffinör som är avsedd för bearbetning av fiberhaltigt material, vilken raffinör innefattar en axel 10, som med lager 12 och 14 är lagrad i ett schematiskt visat stativ 11. Axeln 10 uppbär vid sin ena ände en malskiva 16. Lagerhusen 12, 14 är så anordnade i stativet 11 att axeln är förskjutbar i dessa i axiell riktning, så att den med axeln 10 roterande malskivan 16 kan röra sig mot och från en stationär malskiva 18, vilken likaså är monterad på stativet 11. Genom att skivan 16 är rörlig i axiell riktning mot och från den stationära skivan 18 kan malspaltens bredd varieras. Malskivorna omges under drift av ett icke visat hus. Den beskrivna malapparaten är av konventionellt slag och för närmare beskrivning av de detaljer som är nödvändiga för dess uppbyggnad och funktion hänvisas exempelvis till det svenska patentet 214.707 där dessa detaljer framgår.

Den stationära malskivans malsegment 20, som även visas i figur 2 och 3, är enligt uppfinningen försedd med ett flertal i radiell riktning med mellanrum till varandra anordnade avkännarelement 22, med vilka temperaturen, trycket eller någon annan storhet som anger tillståndet hos malgodset och dess omgivning kan mätas vid varje punkt efter malgodsets rörelsebana från malskivornas centrum eller innerperiferi till deras ytterperiferi. Antalet element 22 kan naturligtvis variera beroende av det antal mätningar som i varje enskilt fall bedöms nödvändigt för att tillförsäkra en tillförlitlig avläsning av storhetens variationer efter malgodsets rörelsebana. Avkännarelementen kan såsom visas i figur 3 vara anordnade i rak radiell linje, men kan även - som i den i figur 2 visade utföringsformen - vara anordnade förskjutna i omkretsens riktning, då malgodset på grund av malskivornas inbördes rotation även meddelas en rörelse i sidled under vandringen utåt till malskivornas ytterperiferi. Förskjutningen i sidled av avkännarelementen 22 motsvarar därvid den beräknade förflyttning som malgodset

undergår på grund av skivornas rotation under de vanligen rådande driftsbetingelserna. Avkännarelementen 22 medger sålunda en kontinuerlig avkänning av malgodsets tillstånd efter hela dess rörelsebana utefter malsegmentet 20.

Den visade utföringsformen avser för enkelhetens skull mätning av temperaturen även om det, såsom nämnts, är tänkbart att även mäta andra tillstånd mellan malskivorna. Såsom framgår av fig. 3, som visar ett snitt genom en del av ett malsegment 20 och det där insatta avkännarelementet 22, består det senare av en bussning 24 av termiskt isolerande material, vilken passerar genom malsegmentet 20 från dess mot den andra malskivans vända framsida 26 till dess baksida 28. I bussningens 24 främre ände är insatt en slitkropp 30 av ett termiskt ledande material, exempelvis silver, medan i direkt anslutning till slitkroppen 30 är anordnat ett termoelement 32 eller liknande från vilket utgår en ledare 34. Som framgår av fig. 1 kan ledarna 34 från de olika avkännarelementen 22 vara anslutna till en dator schematiskt visad vid 36, vilken dels matas med informationen från termoelementen 32 dels med ett styrprogram för malningen. Från datorn 36 är därefter draget ledningar 38 till de olika reglerställena för malförloppets driftsbetingelser, såsom malspaltinställning, spädvattentillförsel, malflödesreglering osv. Det är klart att informationen från termoelementen 32 även kan göras avläsbar med tillhjälp av i och för sig kända indikatorer eller instrument och att den där avlästa informationen kan användas för manuell reglering av malförloppet om så önskas.

Den beskrivna anordningen fungerar på följande sätt: Vid malningen av fiberhaltigt material tillsammans med vatten, med eller utan kemikalier, övergår den största delen (85-95%) av den tillförda energin i värme, varvid vattnet uppvärms och förångas. Förångningen sker då temperaturen överstiger förångningstemperaturen för det tryck som råder vid den speciella punkt mellan malorganen som betraktas. Ju mer energi som tillförs malgodset räknat som energi per viktsenhet av malgodset desto högre blir malgodsets temperatur, vid en och samma koncentration. På motsvarande sätt blir malgodsets temperatur beroende av malskivornas energiöverföring räknat som överförd energi per ytenhet av malskivorna. Malgodsets temperatur är med andra ord en funktion av dess radiella läge mellan malskivorna. Genom mätningen medelst de på olika avstånd från malorganens 16, 18 centrum anordnade avkännarelementen 22 erhålles en kontinuer-

lig temperaturinformation beträffande malgodset vid dess passage genom malspalten och med hjälp av denna information kan sålunda malningsförloppet styras.

Om raffinören pluggar, dvs. flödet av malgods från malskivorna 16, 18 upphör, räcker inte det tillförda vattnet att kyla malgodset, utan temperaturen mellan malskivorna ökar. Detta tillstånd avkännes av elementen 22 och meddelas styrcentralen för malprocessen (manuell eller automatisk) som vidtager nödvändiga åtgärder. Flödet av malgods till raffinören kan då minskas eller stoppas, malspalten ökas och en större vattenmängd tillsättas för att "skölja rent" mellan malskivorna.

Om flödet av malgods till raffinören minskar utan att belastningen på malskivorna 16, 18 (räknat som belastning på drivmotorn) minskar kommer temperaturen att öka mellan malskivorna eftersom den specifika energin ökar. På motsvarande sätt kommer temperaturen i stället att minska om flödet av malgods ökar utan att belastningen på drivmotorn ökar. Om flödet av malgods ökar eller minskar och belastningen ökar eller minskar kommer temperaturen mellan malskivorna 16, 18 att förändras efter den specifikt nedlagda energin. Vid de två senare exemplen kan man återföra energiinsatsen till den ursprungliga nivån genom att förändra antingen malgodsflödet till raffinören eller avståndet mellan malskivorna 16, 18. En annan utväg är att förändra vattentillsatsen så att en större eller mindre kyleffekt uppnås.

Om vätskeinnehållet i malgodset till raffinören (före vattenspädning) minskar blir temperaturen högre mellan malskivorna 16, 18. Mer vatten måste följaktligen tillsättas före malning. På samma sätt minskar temperaturen mellan malskivorna om vätskeinnehållet i malgodset ökar. En minskning av vattentillsatsen är då erforderlig. Eftersom vatten kan tillsättas dels omedelbart före malskivorna 16, 18 dels mellan malskivorna kan mängden vatten till de olika spädningsställena styras med avseende på malskivornas 16, 18 radiella temperaturprofil. Om exempelvis temperaturen i malskivornas ytterzon ökar kan temperaturen minskas genom att öka vattentillsatsen mellan malskivorna och vice versa.

Vid de beskrivna driftsfallen kan sålunda den malgodset tillförda energin snabbt och tillförlitligt regleras genom att den enligt uppfinningen uppmätta temperaturen på malgodset lägges till grund för en manuell eller automatisk justering av malprocessens parametrar för att eliminera de ovannämnda driftsstörningarna och

andra sådana, som kan tänkas uppträda under malningen.

Det är klart att den visade och beskrivna utföringsformen endast är ett exempel på uppfinningens realiserande och att den kan ändras och modifieras inom ramen för de följande patentkraven.

Sålunda kan, såsom nämnts, avkännarelementen 22 ligga i en rät linje efter en radie i stället för att vara anordnade efter en båge i riktning mot malskivans periferi. Såsom nämnts, kan avkännarelementen användas för avkänning eller mätning av temperatur, tryck eller någon annan storhet som anger tillståndet hos malgodset och dess omgivning vid varje enskild punkt efter malskivan. Det är därvid klart att regleringen av malprocessen antingen kan ske efter det uppmätta värdet eller endast efter gradienten, dvs. skillnaden mellan punkterna utan att det direkta värdet registreras.

EXHIBIT B

PATENTKRAV

1. Sätt vid malning av fiberhaltiga material med tillhjälp av relativt varandra roterande malorgan mellan vilka malgods passerar från malorganens innerperiferi till deras ytterperiferi genom en mellan malorganen bildad malspalt, och vid vilket avkännarorgan användes för att avkänna malgodsets tillstånd i malspalten, k ä n n e t e c k n a t av att tillståndet hos malgodset kontinuerligt mätes vid ett flertal punkter i radiell riktning utefter malgodsets passage från malorganens inner- till deras ytterperiferi och att malprocessen styres i beroende av mätresultatet.

2. Sätt enligt kravet 1, k ä n n e t e c k n a t av att man på i och för sig känt sätt mäter trycket och/eller temperaturen vid nämnda punkter.

3. Sätt enligt krav 1 eller 2, k ä n n e t e c k n a t av att man mäter vid punkter som sett i radiell riktning är förskjutna i malorganens rotationsriktning relativt varandra, varvid förskjutningen står i förhållande till malgodsets eventuella förflyttning i perifeririktningen vid malorganens inbördes rotation.

4. Anordning för att genomföra sättet enligt något av kraven 1 - 3, innefattande relativt varandra roterande malorgan som bildar en malspalt i vilken ett fiberhaltigt material införes och males varvid avkännarorgan är insatta i åtminstone det ena malorganet och sträcker sig in i malspalten, k ä n n e t e c k n a d av att flera i radiell riktning med mellanrum till varandra belägna avkännarorgan (22) är anordnade för kontinuerlig mätning av tillståndet hos malgodset under dess passage från malorganens inner- till deras ytterperiferi vilka avkännarorgan är kopplade till en styrcentral (36) för styrning av malprocessen.

5. Anordning enligt kravet 4, k ä n n e t e c k n a d av att avkännarorganen (22) är förskjutna med mellanrum relativt varandra i malorganets (16) perifeririktning.

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Tyskland 663 014 (55 c:6/10)
US 2 405 059 (241-33), 2 548 599 (241-37), 3 434 670 (241-37)

Fig.1

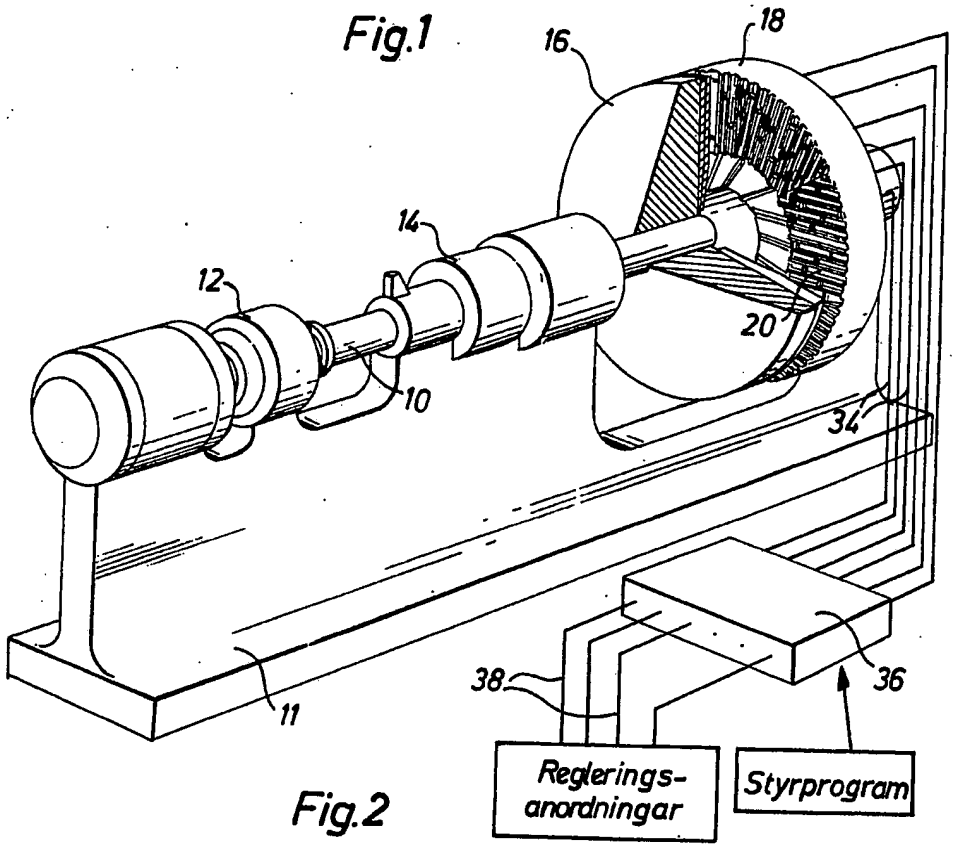
18
16
14
12
20
10
34
38
36
11
Regleringsanordningar
Styrprogram

Fig.2

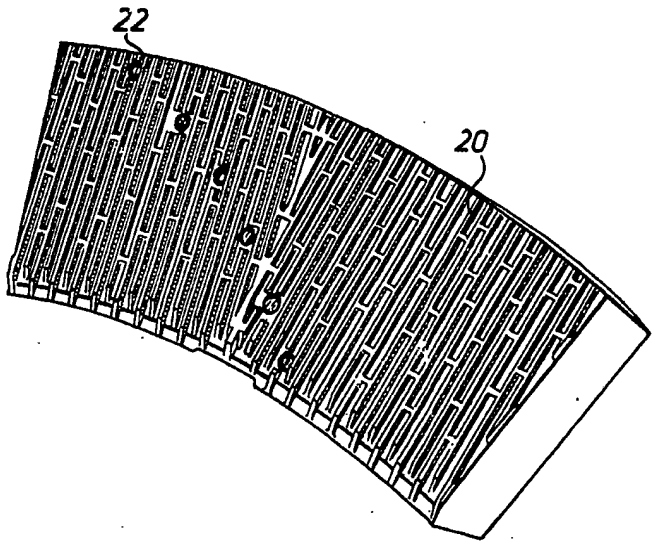
22
20

Fig.3

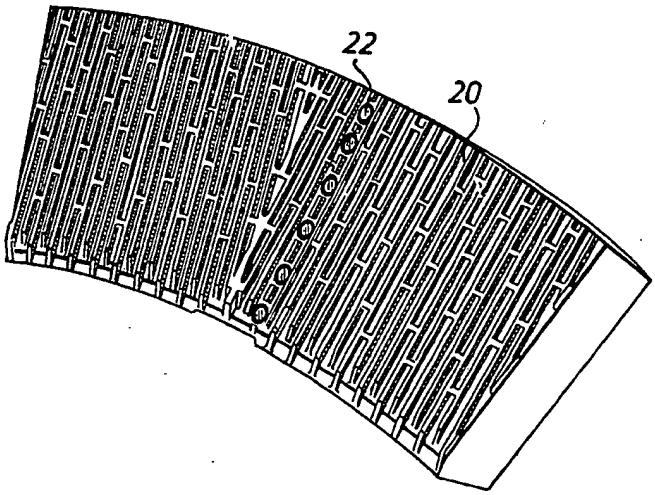

Fig.4